

PATENT COOPERATION TREATY

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INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference BR3532DF/PJ		FOR FURTHER ACTION		See Form PCT/PEA/416
International application No. PCT/EP2004/001017		International filing date (day/month/year) 08.01.2004	Priority date (day/month/year) 08.01.2003	
International Patent Classification (IPC) or national classification and IPC C04B35/536, B32B18/00, B32B7/02				
Applicant CARBONE LORRAINE COMPOSANTS ET AL.				
<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 5 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input type="checkbox"/> sent to the applicant and to the International Bureau a total of 2 sheets, as follows:</p> <p><input type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> <p>b. <input type="checkbox"/> (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p>				
<p>4. This report contains indications relating to the following items:</p> <p><input checked="" type="checkbox"/> Box No. I Basis of the opinion</p> <p><input type="checkbox"/> Box No. II Priority</p> <p><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p><input type="checkbox"/> Box No. IV Lack of unity of invention</p> <p><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p><input type="checkbox"/> Box No. VI Certain documents cited</p> <p><input type="checkbox"/> Box No. VII Certain defects in the international application</p> <p><input type="checkbox"/> Box No. VIII Certain observations on the international application</p>				
Date of submission of the demand 25.10.2004		Date of completion of this report 28.04.2005		
Name and mailing address of the International preliminary examining authority:  European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016		Authorized Officer Raming, T Telephone No. +31 70 340-4232		



**INTERNATIONAL PRELIMINARY REPORT
ON PATENTABILITY**

International application No.
PCT/EP2004/001017

Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
- ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
- ☐ international search (under Rules 12.3 and 23.1(b))
 - ☐ publication of the international application (under Rule 12.4)
 - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report):*

Description, Pages

1-16 as originally filed

Claims, Numbers

6-12, 15-18 as originally filed

1-5, 13, 14 received on 25.10.2004 with letter of 22.10.2004

- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing
3. ☐ The amendments have resulted in the cancellation of:
- ☐ the description, pages
 - ☐ the claims, Nos.
 - ☐ the drawings, sheets/figs
 - ☐ the sequence listing *(specify):*
 - ☐ any table(s) related to sequence listing *(specify):*
4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
- ☐ the description, pages
 - ☐ the claims, Nos.
 - ☐ the drawings, sheets/figs
 - ☐ the sequence listing *(specify):*
 - ☐ any table(s) related to sequence listing *(specify):*

* *If item 4 applies, some or all of these sheets may be marked "superseded."*

**INTERNATIONAL PRELIMINARY REPORT
ON PATENTABILITY**

International application No.
PCT/EP2004/001017

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1-18
	No: Claims	
Inventive step (IS)	Yes: Claims	2
	No: Claims	1,3-18
Industrial applicability (IA)	Yes: Claims	1-18
	No: Claims	

2. Citations and explanations (Rule 70.7):

see separate sheet

Re Item V

**Reasoned statement with regard to novelty, inventive step or industrial applicability;
citations and explanations supporting such statement**

Reference is made to the following documents:

D1: US 2002/182387 A1 (GETZ MATTHEW GEORGE ET AL) 5 December 2002 (2002-12-05)

1. Modifications (Article 34(2) PCT)

The amendments filed with the letter dated 22-10-2004 do not seem to introduce subject-matter which extends beyond the content of the application as filed.

2. Novelty (Article 33(2) PCT)

a. The words "thermal insulation structure" in claim 1 indicate the use of the component, and do not define any technical features of the structure.

These words should be interpreted as meaning "suitable for use as thermal insulation structure". It does not need to be mentioned explicitly in the state of the art that a structure is used for the aforementioned purpose, as long as the structure **could be** used for the aforementioned purposes, it is relevant (see PCT-Guidelines, III, 4.8).

b. The term "flexible", used in claim 1 (and other claims), is only a relative term which is not connected with a generally recognised definition. Such a relative term can not be used to distinguish an invention over the prior art (Guidelines for PCT Examination, part C III, 4.5).

c. Two layers that are laminated together will never have exactly the same density, one will always be at least a bit denser than the other, which means that it does not need to be mentioned in the prior art that two adjacent expanded graphite layers have different density, it can by default be assumed that two adjacent expanded graphite layers have different density, and thus one layer has a lower density.

d. The wordings "designed to be fitted on" in claim 8 introduce the use of the thermal insulation element, and not define any feature of the thermal insulation element itself.

e. Document D1 describes a laminate containing two flexible layers of expanded graphite, one having a thickness of 1 mm and a density of $0,75 \text{ g/cm}^3$, the other having a thickness of 1 mm as well and a density of 1 g/cm^3 . The sheets are resin impregnated, which causes bonding between the two layers (see paragraph 43 and example 1).

In comparison to the cited prior art the subject-matter of the application seems to be novel, thereby meeting the criteria of Article 33(2) PCT.

3. Inventivity (Article 33(3) PCT)

The applicant in his description explains the use of the difference in density between the two graphite layers. The denser layer mainly functions as a support, to strengthen the structure, while the less dense layer should increase the insulation performance. This explanation seems plausible, but this invention only works if there is a clear difference in density between the two layers. As claim 1 is now, the dense layer can have a density of $0,4000 \text{ g/cm}^3$, while the less dense layer can have a density of $0,3999$. It is obvious that in this case the invention will not function, yet this case does fall within the scope of present claim 1. An invention can only be inventive, however, if the invention works over the **whole range** of the claim that claims the invention. This problem can be solved if claim 2 is taken up into the independent claims 1, 13, 17 and 18. Then there would be a clear difference in density between the two graphite layers.

CLAIMS

1. Thermal insulation multi-layer structure comprising at least one flexible layer based on compressed expanded graphite particles characterised in that the density of the said flexible layer, called dense compressed expanded graphite layer, is equal to at least 0.4 g/cm^3 (400 kg/m^3) and in that the said thermal insulation structure also comprises another layer called sub-dense compressed expanded graphite layer, based on compressed graphite particles with a lower density, which is less than 0.4 g/cm^3 (400 kg/m^3), said dense and sub-dense layers being adjacent and bonded to each other.
2. Thermal insulation structure according to claim 1 in which the said dense compressed expanded graphite layer has a density of between 0.5 and 1.6 g/cm^3 (500 and 1600 kg/m^3) and the said sub-dense compressed expanded graphite layer has a density of between 0.05 and 0.3 g/cm^3 (50 and 300 kg/m^3).
3. Thermal insulation structure according to claim 1 or 2 in which the said dense and sub-dense layers made of compressed expanded graphite are adjacent and are bonded to each other by carbonation of a carbonisable binding agent, typically phenolic resin, furfuryl resin or pitch.
4. Thermal insulation structure according to claim 3 in which the adjacent dense and sub-dense layers made of compressed expanded graphite are intimately bonded together over their entire contact surface.
5. Thermal insulation structure according to any one of claims 1 to 4 obtained by stacking the said adjacent dense and sub-dense layers, with one alternation of dense and sub-dense layers made of compressed expanded graphite.

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0.4 g/cm³ (400 kg/m³) typically between 0.5 and 1.6 g/cm³ (500 and 1600 kg/m³).

13. Method for manufacturing a thermal insulation structure, characterised in that it comprises the following steps:

a) making at least one "thick" sub-dense strip with a thickness of less than 40 mm, typically between 5 and 20 mm, by limiting the density obtained by compression of graphite particles to small values of the order of 0.1 g/cm³ (100 kg/m³) and typically within the range of 0.05 g/cm³ (50 kg/m³) to 0.30 g/cm³ (300 kg/m³);

b) making a "thin" dense strip with a thickness of less than 2 mm, typically between 0.15 and 1.5 mm, with a density within the range of 0.5 to 1.6 g/cm³ (500 to 1600 kg/m³);

c) joining said two strips, typically by co-lamination, so as to form multilayer structures that comprise an alternation of adjacent thick sub-dense / thin dense layers, with at least two elements, said assembling being made as follows:

c1) the said sub-dense thick strip is coated with a liquid solution rich in carbon, typically a phenolic resin, a furfuryl resin or pitch;

c2) almost all solvents in the solution, if any, are then eliminated by slow drying;

c3) the said dense thin strip is then added to the coated surface;

c4) heat treatment of thus joined strips under a non-oxidising atmosphere at a temperature of not less than 800°C.

14. Manufacturing method according to claim 13, modified so that two dense thin strips are made in step b) and in that a sub-dense thick strip is placed, typically by co-lamination, between the said two thin strips in step c).